RP364

FURTHER DESCRIPTION AND ANALYSIS OF THE FIRST SPECTRUM OF KRYPTON

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ABSTRACT

A Geissler tube with a capillary of small bore was used "end on" to make a new description of the first spectrum of krypton. On account of the increased intensity compared with tubes viewed side on this procedure permitted the use of a higher powered spectrograph, and has added a large number of new lines. Thus the wave length and intensity data have been improved, several close pairs of lines have been resolved, and the total number of lines characterizing the spectrum of neutral krypton atoms has been extended from about 200 to 460. The spectral terms previously reported have been confirmed by finding many of the predicted combinations, and the analysis has been extended so that the number of classified lines has increased from 180 to 350.

Two years ago the writers published [2] a paper giving a preliminary description and an interpretation of the first spectrum of krypton, and promised to give in later publications data on interferometer comparisons of wave lengths, studies of hyperfine structure, detection of fainter lines, and extensions of series to higher members. A paper on interference measurements of krypton lines has since been published [3] by one of us, and a paper dealing with the hyperfine structure of some of these lines is now in press.[4] In the latter investigation the use of Lummer-Gehrcke interference plates with a Geissler Tube of krypton viewed end on revealed the fact that the line at 8,104 A was double. This observation was checked with our largest concave grating by using the same tube end on and photographing the spectrum in the infra-red. This experience taught us that this Geissler tube with a small-bore capillary emits light of much greater intensity than that obtainable from larger-bore capillaries viewed side on in our earlier work, and gave the incentive to search for fainter lines.

The tube used in the present investigation was made by Robert Goetze, Leipzig; it has two cylindrical electrodes connected by a capillary of 11 cm length and about 1 mm bore, the viewing end being inclosed in a thin-walled glass bulb of 2.5 cm diameter. To emit the arc spectrum this tube was operated with a. c. transformers in exactly the same manner as described in our first paper. (RP89.) The capillary was placed in position on the axis of the spectrograph with the viewing end directed at the slit, and a condensing lens was interposed to image the capillary bore on the slit. When the discharge passes through the tube a brilliant spot is thus projected on the spectrograph.

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[1] Laboratory, "Physica," of the University of Amsterdam.
[2] Meggers, deBruin, and Humphreys, B. S. Jour. Research, vol. 3 (RP89), p. 129; 1929.
[3] Humphreys, B. S. Jour. Research, vol. 5 (RP245), p. 1041; 1930.
[4] Humphreys, B. S. Jour. Research, vol. 7 (RP351), p. —; 1931.

The great increase in light intensity obtained with this end-on tube resulted in a twofold improvement in the description of the Kr I spectrum; it made possible the observation of a large number of fainter lines and permitted their observation with a more powerful spectrograph. Whereas our preliminary description (RP89) was based almost entirely on spectrograms made in the first order of a concave grating with 7,500 lines per inch giving a scale of 10.4 A/mm, the new observations have been made from 3,200 to 9,000 A with a similar grating ruled 20,000 lines per inch giving a scale of 3.7 A/mm in the first order spectrum. Increasing the dispersion and resolving power by a factor of 3 has made it possible to obtain greater accuracy in the wave-length measurements, and has, furthermore, permitted the separation of close lines. These observations with the larger grating were supplemented by exposures to the spectrographs described in our first paper (RP89); the Hilger E_1 quartz spectrograph being used in the ultra-violet, and the Anderson grating in the infra-red. The duration of exposure for making spectrograms ranged from 4 to 24 hours.

Wave-length measurements were made relative to international secondary standards in the arc spectrum of iron. The values from each spectrogram were compared with the interference measurements (RP245), and in a few cases where systematic differences were noted corrections of 0.01 or 0.02 A were applied to the grating values to bring them to the same scale as the interferometer values. When the results were compiled we had more than 1,000 lines ranging in wave length from 3,064 to 9,856 A, but less than half of these are recognized as characteristic of neutral krypton atoms, the remainder being ascribable to ionized atoms and to impurities. Although the Geissler tube was filled with krypton gas of high purity, 50 lines due to argon were recognized in the spectrum, and 5 faint lines were identified with xenon. By far the most troublesome impurity was a trace of water vapor which gives several hundred lines ranging in wave length from 3,064 to about 4,000 A, making it especially difficult to find the fainter members of the principal series of Kr I having a theoretical limit near 3,100 A. These same fine lines were encountered in our earlier work (RP89) and it was suspected that the group beginning at 3,064 A might be identifiable with water vapor. This suspicion has now been confirmed by measurements which agree with those of Grebe and Holtz [5] who remark that the appearance of water vapor bands is a common occurrence in Geissler tubes. The bands are ascribed to the OH molecule by Watson [6] who has analyzed their structure.

A considerable number of lines observed with the end-on krypton tube were found to be greatly enhanced when the tube was operated with a condensed discharge and series spark gap, thus proving that they belong to ionized krypton atoms. In this respect the end-on tube is at a disadvantage; the side-on tubes used in our earlier work showed hardly a trace of spark lines when operated with uncondensed discharges.

Still another difficulty was met with in preparing a new list of true Kr I lines. When an imperfect grating is used to record long exposures to an intense source of sharp spectral lines it is not unusual

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[5] Grebe and Holtz. Annalen der Physik. 39, p. 1243; 1912.
[6] Watson, Astrophys. J. 60, p 145; 1924.

to find a family of Rowland ghosts accompanying each strong line, and sometimes obscuring real lines. The Anderson grating is almost completely free from this trouble, but the Rowland grating used for making most of the new observations showed from 2 to 16 symmetrically placed ghosts on all lines ranging from 20 to 2,000 in our scale of estimated intensities.

After all spurious and impurity lines were removed about 460 lines remain to describe the first spectrum of krypton. These are presented in Table 3, in which the measured wave length, estimated intensity, vacuum wave number, and term combination appear in successive columns. Wave lengths of the stronger lines which have been measured by interferometer comparisons with neon standards are quoted from the paper already referred to. (RP245.) Since this new list contains more than twice the number of lines given in our preliminary description (RP89) and includes more than 200 fainter lines it has been necessary to revise the earlier estimates of relative intensity. For lines common to both lists, the present intensity estimates are from 5 to 10 times greater than before.

An entirely new term table has been prepared. The numerical values of terms already reported remain essentially unchanged, but the increased precision of the measurements, the fact that most of the series have been extended and several new series discovered, and new interpretations placed upon a few of the terms has made advisable this revision of the term table. Table 2 contains the new term values and effective quantum numbers. The absolute value of the terms was fixed as before by determining the limit of the series $2p_9 - md'_4$. The calculation is presented in Table 1. The Rydberg constant for krypton has been recalculated using the value of R_∞, 109,737.42, given by Birge,[7] and is now given as 109,736.695. The use of this value in connection with the new wave length measurements leads to a value of $1s_5$ equal to 32,943.165 as against 32,943.47 given in the previous paper. As far as possible the relative term values were fixed by interferometer measurements. The term values given in the report on the interference measurements (RP245) have been incorporated in the new term table with the displacement necessary to make them conform to the new value of $1s_5$. These include the $1s$, $2p$, and $3p$ terms and can be given to three decimal places. A number of additional terms for which the relative values can be completely determined from combination lines measured by interference methods are given to the thousandth of a wave number unit.

[7] Birge, Phys. Rev. Supplement 1, p. 49; 1929.

TABLE 1.—*Determination of absolute term values in Kr I*

$2p_9 - md'_4$ $(5p\,^3D_3 - 5d\,^3F_4)$

$$\nu = A - \frac{R}{[m+\mu+\alpha(A-\nu)]^2}$$

$R_{Kr} = 109{,}736.695$
$A = 20{,}620.504$
$\mu = +0.5985937937$
$\alpha = +0.000004625591474$

m	Int.	λ_{obs}	ν_{obs}	$\nu_{calc.}$	$\nu_{calc.} - \nu_{obs}$
2				5, 225. 061	
3	30	8, 104. 02	12, 336. 17	12, 324. 425	−11. 74
4	200	6, 456. 293	15, 484. 493	15, 484. 493	00
5	100	5, 832. 85	17, 139. 54	17, 139. 54	00
6	40	5, 520. 52	18, 109. 22	18, 109. 073	−. 15
7	20	5, 339. 13	18, 724. 45	18, 724. 307	−. 14
8	5	5, 223. 57	19, 138. 68	19, 138. 652	−. 03
9	2*h*	5, 145. 04	19, 430. 80	19, 430. 80	00
10	2*h*	5, 089. 12	19, 644. 30	19, 644. 424	+1. 12

$1s_5 - 2p_9 = 12{,}322.661$
$2p_9 = 20{,}620.504$
$\therefore\ 1s_5 = 32{,}943.165$

ve quantum numbers of Kr I

Electro	m=							
	5		6		10		11	
p								
s		5. 8902	2, 306. 57	6.				
		5. 9158	2, 295. 92	6.				
p		5. 3512	2, 734. 83	6.				
		5. 3655	2, 705. 35	6.				
		5. 3674	2, 705. 06	6.				
		5. 3984	2, 680. 06	6.				
		5. 4066	2, 672. 08	6.				
		5. 5068	2, 606. 77	6.				
f		4. 9747	3, 078. 62	5.				
		4. 9693	3, 105. 74	5.				
		4. 9877	3, 062. 61	5.				
d		4. 5455	3, 583. 95	5.		9. 5367		
		4. 5768	3, 571. 95	5.		9. 5758		
		4. 6224	3, 480. 96	5.		9. 6041	976. 20	10. 6024
		4. 6305	3, 539. 56	5.		9. 6281		
		4. 6671	3, 443. 43	5.		9. 6515	968. 00	10. 6472
		4. 7215	3, 387. 34	5.				
		4. 7476	3, 335. 88	5.		9. 7239		
		4. 8547	3, 226. 14	5.				

74280—31. (Face p. 646.)

Table 2.—*Terms and effective quantum numbers of Kr I*

Electron	j	Term, Paschen notation		m=																					
				1		2		3		4		5		6		7		8		9		10		11	
p	0	p_0	112, 914. 17 =13. 930 volts																						
s	2	s_5		32, 943. 165	1. 8252	(13, 500±)		7, 267. 421	3. 8858	4, 589. 89	4. 8896	3, 162. 96	5. 8902	2, 306. 57	6. 8975	1, 760. 51	7. 8951	1, 387. 08	8. 8946						
	1	s_4		31, 998. 139	1. 8519	13, 023	2. 9028	7, 144. 21	3. 9192	4, 541. 83	4. 9154	3, 135. 59	5. 9158	2, 295. 92	6. 9135	1, 744. 08	7. 9322	1, 374. 03	8. 9367						
	0	s_3		27, 723. 281	1. 8221	8, 393. 307	2. 8278																		
	1	s_2		27, 068. 192	1. 8404	8, 027. 588	2. 8662																		
p	1	p_{10}				21, 746. 389	2. 2464	10, 027. 695	3, 3081	5, 909. 57	4. 3092	3, 832. 19	5. 3512	2, 734. 83	6. 3345	2, 042. 48	7. 3299								
	3	p_9				20, 620. 503	2. 3069	9, 799. 251	3. 3464	5, 773. 85	4. 3596	3, 811. 84	5. 3655	2, 705. 35	6. 3689	2, 019. 12	7. 3722	1, 564. 98	8. 3738						
	2	p_8				20, 607. 524	2. 3076	9, 793. 745	3. 3474	5, 774. 13	4. 3595	3, 809. 12	5. 3674	2, 705. 06	6. 3692										
	1	p_7				19, 950. 507	2. 3453	9, 601. 415	3. 3807	5, 693. 60	4. 3902	3, 765. 35	5. 3984	2, 680. 06	6. 3989										
	2	p_6				19, 791. 563	2. 3547	9, 552. 277	3. 3894	5, 668. 23	4. 4000	3, 754. 04	5. 4066	2, 672. 08	6. 4084	1, 998. 84	7. 4095	1, 550. 40	8. 4131						
	0	p_5				18, 822. 039	2. 4146	9, 153. 252	3. 4625	5, 504. 54	4. 4649	3, 618. 73	5. 5068	2, 606. 77	6. 4882	1, 958. 67	7. 4851	1, 524. 57	8. 4840						
	1	p_4				15, 318. 979	2. 3053	4, 476. 620	3. 3452																
	1	p_3				14, 995. 746	2. 3236	4, 400. 695	3. 3582																
	2	p_2				14, 969. 727	2. 3250	4, 347. 112	3. 3675																
	0	p_1				14, 059. 824	2. 3790	4, 093. 310	3. 4125																
f	1	X								6, 949. 58	3. 9737	4, 434. 16	4. 9747	3, 078. 62	5. 9703	2, 259. 64	6. 9688	1, 727. 10	7. 9711						
	2	Y								6, 893. 56	3. 9898	4, 443. 788	4. 9693	3, 105. 74	5. 9442										
	2	Z								6, 950. 38	3. 9735	4, 411. 23	4. 9877	3, 062. 61	5. 9859	2, 249. 49	6. 9845								
d	0	d_6								8, 841. 431	3. 5230	5, 311. 28	4. 5455	3, 583. 95	5. 5334	2, 624. 55	6. 4662	1, 981. 54	7. 4417	1, 502. 47	8. 5462	1, 206. 59	9. 5367		
	1	d_5						13, 267	2. 8760	9, 113. 135	3. 4701	5, 238. 73	4. 5768	3, 571. 95	5. 5427	2, 579. 23	6. 5228	1, 911. 91	7. 5760	1, 486. 34	8. 5925	1, 196. 75	9. 5758		
	4	d'_4								8, 284. 33	3. 6395	5, 136. 010	4. 6224	3, 480. 96	5. 6147	2, 511. 28	6. 6104	1, 896. 05	7. 6077	1, 481. 82	8. 6055	1, 189. 70	9. 6041	976. 20	10. 6024
	2	d_3								7, 907. 660	3. 7252	5, 117. 98	4. 6305	3, 539. 56	5. 5680	2, 402. 13	6. 7589	1, 867. 81	7. 6650	1, 469. 52	8. 6415	1, 183. 77	9. 6281		
	3	d_4								7, 998. 424	3. 7040	5, 037. 988	4. 6671	3, 443. 43	5. 6452	2, 444. 00	6. 7008			1, 464. 48	8. 6564	1, 178. 05	9. 6515	968. 00	10. 6472
	2	d_1''								7, 751. 41	3. 7626	4, 922. 09	4. 7215	3, 387. 34	5. 6918	2, 418. 23	6. 7364	1, 843. 46	7. 7154	1, 447. 56	8. 7068				
	3	d_1'								9, 213. 47	3. 4512	4, 868. 55	4. 7476	3, 335. 88	5. 7355	2, 406. 81	6. 7527	1, 835. 85	7. 7314	1, 440. 83	8. 7271	1, 160. 56	9. 7239		
	1	d_2								7, 266. 47	3. 8861	4, 656. 11	4. 8547	3. 226. 14	5. 8322	2, 400. 86	6. 7607	1, 810. 54	7. 7852						
	1	s_1'						7, 768. 55	2. 8944	2, 811. 65	3. 6712														
	2	s_1''						9, 472. 21	2. 7228	2, 792. 82	3. 6756														
	3	s_1'''						9, 648. 50	2. 7067	2, 884. 61	3. 6550														
	2	s_1''''								3, 609. 76	3. 5036														

TABLE 3.—*List of Kr I lines*

Intensity	Wave length	Wave number	Comb.
1	3, 184. 53	31, 392. 76	$1s_5-8p_6$
1	3, 186. 01	31, 378. 18	$1s_5-8p_{8,9}$
2	3, 230. 68	30, 944. 33	$1s_5-7p_6$
2	3, 232. 80	30, 924. 04	$1s_5-7p_{8,9}$
1	3, 257. 10	30, 693. 34	$1s_5-7Z$
1*h*	3, 258. 00	30, 684. 86	$1s_5-7X$
1	3, 280. 59	30, 473. 57	$1s_4-8p_5$
10	3, 302. 54	30, 271. 04	$\{1s_5-6p_6$; $1s_4-8X$
7	3, 306. 17	30, 237. 81	$1s_5-6p_{8,9}$
2−	3, 328. 00	30, 039. 47	$1s_4-7p_5$
1−	3, 332. 47	29, 999. 17	$1s_4-7p_6$
1−	3, 334. 47	29, 981. 18	$1s_4-7p_8$
1	3, 337. 17	29, 956. 92	$1s_4-7p_{10}$
4	3, 345. 73	29, 880. 28	$1s_5-6Z$
2	3, 347. 50	29, 864. 48	$1s_5-6X$
2	3, 361. 74	29, 737. 98	$1s_4-7X$
5	3, 401. 40	29, 391. 25	$1s_4-6p_5$
2	3, 408. 97	29, 325. 99	$1s_4-6p_6$
2	3, 409. 89	29, 318. 08	$1s_4-6p_7$
1	3, 412. 80	29, 293. 08	$1s_4-6p_8$
15	3, 424. 97	29, 189. 00	$1s_5-5p_6$
2	3, 426. 27	29, 177. 92	$1s_5-5p_7$
2	3, 431. 45	29, 133. 88	$1s_5-5p_8$
20	3, 431. 75	29, 131. 33	$1s_5-5p_9$
8	3, 434. 16	29, 110. 89	$1s_5-5p_{10}$
1	3, 454. 90	28, 936. 14	$1s_4-6Z$
3	3, 456. 87	28, 919. 65	$1s_4-6X$
2	3, 460. 13	28, 892. 40	$1s_4-6Y$
10	3, 495. 99	28, 596. 05	$1s_5-3p_2$
20	3, 502. 56	28, 542. 41	$1s_5-3p_3$
15	3, 503. 90	28, 531. 50	$1s_5-5Z$
3	3, 506. 66	28, 509. 04	$1s_5-5X$
3	3, 507. 84	28, 499. 45	$1s_5-5Y$
4	3, 511. 91	28, 466. 42	$1s_5-3p_4$
15	3, 522. 68	28, 379. 39	$1s_4-5p_5$
5	3, 539. 55	28, 244. 14	$1s_4-5p_6$
5	3, 540. 97	28, 232. 81	$1s_4-5p_7$
3	3, 546. 46	28, 189. 10	$1s_4-5p_8$
1	3, 549. 44	28, 165. 44	$1s_4-5p_{10}$
20	3, 615. 48	27, 650. 99	$1s_4-3p_2$
1	3, 622. 53	27, 597. 18	$1s_4-3p_3$
1	3, 623. 84	27, 587. 20	$1s_4-5Z$
2	3, 626. 91	27, 563. 85	$1s_4-5X$
10	3, 628. 17	27, 554. 28	$1s_4-5Y$
4	3, 632. 51	27, 521. 36	$1s_4-3p_4$
80	3, 665. 33	27, 274. 93	$1s_5-4p_6$
10	3, 668. 74	27, 249. 58	$1s_5-4p_7$
100	3, 679. 58	27, 169. 31	$1s_5-4p_{8,9}$
6	3, 698. 05	27, 033. 61	$1s_5-4p_{10}$

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
50	3, 773. 43	26, 493. 59	$1s_4-4p_5$
20	3, 796. 88	26, 329. 97	$1s_4-4p_6$
30	3, 800. 55	26, 304. 54	$1s_4-4p_7$
20	3, 812. 22	26, 224. 02	$1s_4-4p_8$
30	3, 837. 81	26, 049. 16	$1s_5-4Y$
15	3, 845. 98	25, 993. 82	$1s_5-4X$
2	3, 846. 12	25, 992. 88	$1s_5-4Z$
1	3, 892. 69	25, 681. 92	$1s_3-7p_{10}$
1	3, 915. 16	25, 534. 53	
1	3, 926. 05	25, 463. 71	$1s_3-7X$
1	3, 953. 60	25, 286. 27	
6	3, 982. 18	25, 104. 73	$1s_4-4Y$
20	3, 991. 08	25, 048. 81	$1s_4-4X$
10	3, 991. 25	25, 047. 75	$1s_4-4Z$
3	3, 994. 82	25, 025. 34	$1s_2-7p_{10}$
2	4, 000. 72	24, 988. 46	$1s_3-6p_{10}$
1	4, 028. 03	24, 819. 04	$1s_2-7Z$
2	4, 029. 66	24, 809. 00	$1s_2-7X$
3	4, 056. 57	24, 644. 43	$1s_2-6X$
2	4, 086. 90	24, 461. 54	$1s_2-6p_5$
1	4, 097. 84	24, 396. 24	$1s_2-6p_6$
3	4, 108. 43	24, 333. 36	$1s_2-6p_{10}$
1	4, 139. 04	24, 153. 40	
2	4, 164. 48	24, 005. 85	$1s_2-6Z$
5*d*	4, 167. 28	23, 989. 73	$1s_2-6X$
3	4, 172. 83	23, 957. 82	$1s_3-5p_7$
20	4, 184. 48	28, 891. 12	$1s_3-5p_{10}$
20	4, 263. 29	23, 449. 48	$1s_2-5p_5$
1, 000	4, 273. 9705	23, 390. 8876	$1s_5-3p_6$
100	4, 282. 9686	23, 341. 7469	$1s_5-3p_7$
40	4, 286. 4875	23, 322. 5849	$1s_3-3p_3$
5	4, 288. 02	23, 314. 25	$1s_2-5p_6$
4	4, 290. 78	23, 299. 25	
6	4, 292. 64	23, 289. 16	$1s_3-5X$
1	4, 295. 82	23, 271. 92	
50	4, 300. 4877	23, 246. 6602	$1s_3-3p_4$
10	4, 302. 45	23, 236. 06	$1s_2-5p_{10}$
400	4, 318. 5523	23, 149. 4203	$1s_5-3p_8$
1, 000	4, 319. 5798	23, 143. 9137	$1s_5-3p_9$
1	4, 340. 84	23, 030. 56	
2	4, 349. 55	22, 984. 44	
1	4, 349. 84	22, 982. 91	
100	4, 351. 3605	22, 974. 8824	$1s_2-3p_1$
2	4, 353. 90	22, 961. 48	
2	4, 354. 23	22, 959. 74	
500	4, 362. 6429	22, 915. 4670	$1s_5-3p_{10}$
800	4, 376. 1217	22, 844. 8870	$1s_4-3p_5$
2	4, 380. 11	22, 824. 09	
200	4, 399. 9675	22, 721. 0802	$1s_2-3p_2$
1	4, 406. 76	22, 686. 06	

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
50	4, 410. 369	22, 667. 498	$1s_2-3p_3$
6	4, 412. 39	22, 657. 11	$1s_2-5Z$
20	4, 416. 88	22, 634. 08	$1s_2-5X$
1	4, 417. 58	22, 630. 49	
50	4, 418. 769	22, 624. 404	$1s_2-5Y$
1	4, 421. 30	22, 611. 45	
100	4, 425. 1909	22, 591. 5728	$1s_2-3p_4$
600	4, 453. 9183	22, 445. 8618	$1s_4-3p_6$
800	4, 463. 6897	22, 396. 7266	$1s_4-3p_7$
600	4, 502. 3546	22, 204. 3931	$1s_4-3p_8$
3	4, 538. 06	22, 029. 69	$1s_3-4p_7$
40	4, 550. 298	21, 970. 446	$1s_4-3p_{10}$
20	4, 636. 14	21, 563. 65	$1s_2-4p_5$
10	4, 671. 61	21, 399. 92	$1s_2-4p_6$
1	4, 677. 16	21, 374. 53	$1s_2-4p_7$
4	4, 694. 84	21, 294. 04	$1s_2-4p_8$
3	4, 722. 16	21, 170. 84	
20	4, 724. 89	21, 158. 61	$1s_2-4p_{10}$
3	4, 810. 51	20, 782. 03	
40	4, 812. 607	20, 772. 971	$1s_3-4X$
4*h*	4, 861. 31	20, 564. 86	
2*h*	4, 861. 84	20, 562. 62	$2p_{10}-10d_3$
2*h*	4, 864. 91	20, 549. 64	$2p_{10}-10d_5$
1*h*	4, 867. 24	20, 539. 80	$2p_{10}-10d_6$
2	4, 910. 39	20, 359. 31	$2p_{10}-8s_5$
4*h*	4, 930. 38	20, 276. 77	$2p_{10}-9d_3$
4*h*	4, 934. 48	20, 259. 92	$2p_{10}-9d_5$
2*h*	4, 938. 38	20, 243. 92	$2p_{10}-9d_6$
15	4, 955. 27	20, 174. 92	$1s_2-4Y$
20	4, 969. 08	20, 118. 85	$1s_2-4X$
15	4, 969. 36	20, 117. 72	$1s_2-4Z$
2	5, 002. 14	19, 985. 88	$2p_{10}-7s_5$
5	5, 029. 15	19, 878. 55	$2p_{10}-8d_3$
7	5, 040. 34	19, 834. 52	$2p_{10}-8d_5$
4	5, 058. 08	19, 764. 85	$2p_{10}-8d_6$
2*h*	5, 089. 12	19, 644. 30	$2p_9-11d_4'$
1*h*	5, 090. 36	19, 639. 52	$2p_8-11d_4$
2	5, 109. 81	19, 564. 76	
1	5, 139. 9	19, 450. 23	$2p_{10}-6s_4$
4	5, 142. 7	19, 439. 64	$2p_{10}-6s_5$
2*h*	5, 145. 04	19, 430. 80	$2p_9-10d_4'$
1*h*	5, 145. 39	19, 429. 47	$2p_8-10d_4$
1	5, 167. 73	19, 345. 48	$2p_{10}-7d_2$
4	5, 168. 06	19, 344. 25	$2p_{10}-7d_3$
2	5, 172. 36	19, 328. 16	$2p_{10}-7d_1''$
1*h*	5, 197. 82	19, 233. 49	$\begin{cases}2p_9-8s_5\\2p_8-8s_4\end{cases}$
1	5, 212. 41	19, 179. 66	$2p_9-9d_1'$
8	5, 215. 81	19, 167. 16	$2p_{10}-7d_5$
1	5, 217. 78	19, 159. 92	$2p_8-9d_1''$

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
1	5, 218. 84	19, 156. 03	$2p_9-9d_4$
3	5, 222. 38	19, 143. 04	$2p_8-9d_4$
5	5, 233. 57	19, 138. 68	$2p_9-9d_4'$
20	5, 228. 18	19, 121. 84	$2p_{10}-7d_6$
2	5, 232. 06	19, 107. 63	
4	5, 274. 61	18, 953. 49	$2p_{10}-4s_1''$
9	5, 279. 84	18, 934. 71	$2p_{10}-4s_1'$
1	5, 290. 76	18, 895. 63	
2*h*	5, 299. 79	18, 863. 44	$2p_8-7s_4$
3	5, 300. 74	18, 860. 06	$2p_9-7s_5$
1	5, 304. 43	18, 846. 94	$2p_8-7s_5$
2	5, 322. 02	18, 784. 65	$2p_9-8d_1'$
1—	5, 325. 70	18, 771. 67	$2p_8-8d_1'$
2	5, 327. 87	18, 764. 02	$2p_8-8d_1''$
2	5, 331. 08	18, 752. 72	$2p_9-8d_3$
10	5, 334. 78	18, 739. 72	$2p_8-8d_3$
1	5, 337. 72	18, 729. 40	
20	5, 339. 13	18, 724. 45	$2p_9-8d_4'$
2	5, 347. 37	18, 695. 60	$2p_8-8d_5$
1*h*	5, 365. 91	18, 631. 00	$2p_6-10d_1'$
2	5, 371. 74	18, 610. 78	$2p_{10}-5s_4$
15	5, 379. 64	18, 583. 45	$2p_{10}-5s_5$
2*h*	5, 403. 03	18, 503. 00	$2p_7-9d_1''$
1*h*	5, 409. 44	18, 481. 08	$2p_7-9d_3$
1—	5, 445. 43	18, 358. 93	$2p_{10}-6d_1''$
3*h*	5, 447. 86	18, 350. 75	$2p_6-9d_1'$
2*h*	5, 456. 39	18, 322. 06	$2p_6-9d_3$
7	5, 458. 80	18, 313. 97	$2p_9-6s_5$
4	5, 459. 47	18, 311. 72	$2p_8-6s_4$
1	5, 461. 37	18, 305. 35	$2p_6-9d_5$
2	5, 462. 65	18, 301. 06	$2p_8-6s_5$
2	5, 476. 58	18, 254. 51	
1	5, 487. 46	18, 218. 32	$2p_9-7d_3$
5	5, 488. 86	18, 213. 67	$2p_9-7d_1'$
50	5, 490. 94	18, 206. 77	$\begin{cases}2p_{10}-6d_3\\2p_7-7s_4\end{cases}$
2*h*	5, 491. 33	18, 205. 48	$2p_8-7d_3$
1	5, 492. 77	18, 200. 71	$2p_8-7d_1'$
3	5, 496. 21	18, 189. 31	$2p_8-7d_1''$
50	5, 500. 71	18, 174. 43	$2p_{10}-6d_5$
15	5, 504. 02	18, 163. 50	$2p_8-7d_4$
20	5, 504. 34	18, 162. 45	$2p_{10}-6d_6$
1	5, 511. 16	18, 139. 97	$2p_7-8d_2$
20	5, 516. 66	18, 121. 89	$1s_3-3p_7$
40	5, 520. 52	18, 109. 22	$2p_9-7d_4'$
3	5, 521. 17	18, 107. 09	$2p_7-8d_1''$
1	5, 522. 18	18, 103. 78	
2—	5, 528. 63	18, 082. 66	$2p_7-8d_3$
1*h*	5, 539. 4	18, 047. 50	$2p_6-7s_4$
1*h*	5, 544. 4	18, 031. 22	$2p_5-7s_5$
500	5, 562. 2251	17, 973. 4381	$1s_5-2p_2$

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
2, 000	5, 570. 2890	17, 947. 4190	$1s_5–2p_3$
2	5, 573. 13	17, 938. 27	$1s_4–2p_1$
10	5, 575. 6	17, 930. 32	
3*h*	5, 577. 64	17, 923. 77	$2p_6–8d_3$
80	5, 580. 39	17, 914. 93	$1s_2–3p_5$
1*h*	5, 581. 34	17, 911. 88	
2	5, 591. 41	17, 879. 62	$2p_6–8d_5$
1	5, 606. 74	17, 830. 74	
1	5, 607. 72	17, 827. 62	$2p_9–4s_1''$
3	5, 608. 37	17, 825. 56	
4	5, 611. 82	17, 814. 60	$2p_8–4s_1''$
1	5, 643. 04	17, 716. 04	
100	5, 649, 5627	17, 695, 5863	$1s_3–3p_{10}$
3	5, 662. 67	17, 654. 63	$2p_7–6s_4$
1	5, 666. 09	17, 643. 97	$2p_7–6s_5$
50	5, 672. 45	17, 624. 19	$1s_5–2p_4$
3—	5, 696. 54	17, 549. 66	$2p_7–7d_2$
1	5, 696. 95	17, 548. 39	$2p_7–7d_3$
10	5, 702. 19	17, 532. 27	$2p_7–7d_1''$
40	5, 707. 51	17, 515. 93	$1s_2–3p_6$
2	5, 714. 11	17, 495. 70	$2p_6–6s_4$
3	5, 717. 61	17, 484. 99	$2p_6–6s_5$
10	5, 721. 88	17, 471. 94	$2p_8–5s_4$
15	5, 723. 56	17, 466. 81	$1s_2–3p_7$
20	5, 726. 59	17, 457. 57	$2p_9–5s_5$
4	5, 730. 86	17, 444. 56	$2p_8–5s_5$
5	5, 749. 02	17, 389. 46	$2p_6–7d_3$
10	5, 750. 57	17, 384. 77	$2p_6–7d_1'$
1	5, 754. 33	17, 373. 41	$2p_6–7d_1''$
2	5, 755. 04	17, 371. 27	$2p_7–7d_5$
4	5, 762. 90	17, 347. 58	$2p_6–7d_4$
2	5, 775. 56	17, 309. 55	
10	5, 783. 89	17, 284. 62	$2p_9–6d_1$
6	5, 787. 29	17, 274. 47	$1s_2–3p_8$
7	5, 788. 24	17, 271. 63	$2p_8–6d_1'$
2	5, 801. 17	17, 233. 13	$2p_9–6d_1''$
20	5, 805. 53	17, 220. 19	$2p_8–6d_1''$
8	5, 810. 80	17, 204. 58	$2p_{10}–4s_4$
1	5, 814. 29	17, 194. 25	
1	5, 818. 97	17, 180. 42	
15	5, 820. 10	17, 177. 08	$2p_9–6d_4$
3	5, 823. 51	17, 167. 03	$2p_6–7d_6$
40	5, 824. 50	17, 164. 11	$2p_8–6d_4$
20	5, 827. 07	17, 156. 54	$2p_{10}–4s_5$
100	5, 832. 85	17, 139. 54	$2p_9–6d_4'$
1	5, 843. 29	17, 108. 92	
1	5, 849. 12	17, 091. 86	
2	5, 849. 66	17, 090. 28	$2p_{10}–5d_2$
5	5, 852. 86	17, 080. 94	$2p_9–6d_3$
1	5, 857. 32	17, 067. 93	$2p_8–6d_3$

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
50	5, 866. 74	17, 040. 53	$1s_2-3p_{10}$
3, 000	5, 870. 9153	17, 028. 4108	$1s_4-2p_2$
50	5, 879. 89	17, 002. 42	$1s_4-2p_3$
2	5, 881. 18	16, 998. 69	$2p_6-4s_1''$
3	5, 887. 68	16, 979. 92	$2p_6-4s_1'$
2	5, 942. 13	16, 824. 33	$2p_{10}-5d_1''$
5	5, 945. 44	16, 814. 97	$2p_7-5s_4$
2	5, 955. 14	16, 787. 59	$2p_7-5s_5$
4	5, 977. 65	16, 724. 36	$2p_7-6d_2$
60	5, 993. 8500	16, 679. 1585	$1s_4-2p_4$
3	6, 002. 19	16, 655. 98	$2p_6-5s_4$
50	6, 012. 111	16, 628. 499	$\begin{cases} 2p_{10}-5d_3 \\ 2p_6-5s_5 \end{cases}$
15	6, 035. 82	16, 563. 18	$2p_8-6d_1''$
60	6, 056. 11	16, 507. 69	$2p_{10}-5d_5$
20	6, 075. 24	16, 455. 71	$2p_6-6d_1'$
40	6, 082. 85	16, 435. 12	$2p_{10}-5d_6$
2	6, 088. 00	16, 421. 22	$2p_5-7d_2$
6	6, 091. 81	16, 410. 95	$2p_7-6d_3$
2	6, 094. 31	16, 404. 22	$2p_6-6d_1''$
1	6, 103. 86	16, 378. 55	$2p_6-6d_5$
3	6, 108. 34	16, 366. 54	$2p_7-6d_6$
3	6, 115. 23	16, 348. 10	$2p_6-6d_4$
20	6, 151. 38	16, 252. 02	$2p_6-6d_3$
7	6, 163. 65	16, 219. 68	$2p_6-6d_5$
2	6, 172. 08	16, 197. 52	$2p_5-7d_6$
20	6, 222. 71	16, 065. 73	$2p_8-4s_4$
30	6, 236. 34	16, 030. 62	$2p_9-4s_5$
10	6, 241. 39	16, 017. 65	$2p_8-4s_5$
2	6, 267. 33	15, 951. 36	$2p_8-5d_2$
20	6, 346. 66	15, 751. 97	$2p_9-5d_1'$
8	6, 351. 90	15, 738. 98	$2p_8-5d_1'$
4	6, 368. 26	15, 698. 55	$2p_9-5d_1''$
1	6, 373. 19	15, 686. 40	$2p_5-5s_4$
30	6, 373. 58	15, 685. 44	$2p_8-5d_1''$
5	6, 410. 17	15, 595. 91	$2p_5-6d_2$
20	6, 415. 65	15, 582. 59	$2p_9-5d_4$
100	6, 421. 028	15, 569. 536	$2p_8-5d_4$
10	6, 448. 78	15, 502. 53	$2p_9-5d_3$
1	6, 454. 19	15, 489. 54	$2p_8-5d_3$
200	6, 456. 293	15, 484. 493	$2p_9-5d_4'$
15	6, 488. 07	15, 408. 65	$2p_7-4s_4$
10	6, 504. 89	15, 368. 81	$2p_8-5d_5$
3	6, 508. 37	15, 360. 59	$2p_7-4s_5$
8	6, 536. 55	15, 294. 37	$2p_7-5d_2$
2	6, 555. 56	15, 250. 02	$2p_5-6d_5$
6	6, 555. 69	15, 249. 72	$2p_6-4s_4$
20	6, 576. 42	15, 201. 65	$2p_7-4s_5$
2	6, 605. 12	15, 135. 60	$2p_6-5d_2$
2−	6, 612. 38	15, 118. 98	

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
40	6, 652. 24	15, 028. 39	$2p_7-5d_1''$
1	6, 691. 43	14, 940. 37	
60	6, 699. 23	14, 922. 98	$2p_6-5d_1'$
4	6, 723. 36	14, 869. 42	$2p_6-5d_1''$
20	6, 740. 10	14, 832. 49	$2p_7-5d_3$
3	6, 776. 15	14, 753. 56	$2p_6-5d_4$
4	6, 795. 40	14, 711. 78	$2p_7-5d_5$
50	6, 813. 10	14, 673. 56	$2p_6-5d_3$
8	6, 829. 09	14, 639. 21	$2p_7-5d_6$
20	6, 846. 40	14, 602. 19	$2p_{10}-3s_4$
2	6, 853. 32	14, 587. 45	
1	6, 860. 04	14, 573. 16	
3	6, 862. 82	14, 567. 26	
1	6, 866. 89	14, 558. 62	
20	6, 869. 63	14, 552. 82	$2p_6-5d_5$
15	6, 904. 22	14, 479. 91	$2p_{10}-4d_2$
100	6, 904. 68	14, 478. 94	$2p_{10}-3s_5$
1*h*	6, 935. 30	14, 415. 02	
1	6, 988. 51	14, 305. 26	
2	6, 993. 05	14, 296. 98	
1	6, 995. 52	14, 290. 93	
7	7, 000. 79	14, 280. 17	$2p_5-4s_4$
2	7, 001. 62	14, 278. 47	
1	7, 004. 29	14, 273. 03	
2	7, 008. 62	14, 264. 21	
1	7, 011. 31	14, 258. 74	
1	7, 041. 86	14, 198. 25	
1	7, 048. 89	14, 182. 72	
10	7, 057. 27	14, 165. 88	$2p_5-5d_2$
1	7, 085. 47	14, 109. 51	
1*h*	7, 089. 51	14, 101. 47	
8	7, 143. 45	13, 994. 99	$2p_{10}-4d_1''$
5	7, 152. 21	13, 977. 84	$2p_{10}-3s_1'$
3	7, 180. 47	13, 922. 83	
2*h*	7, 200. 59	13, 883. 93	
100	7, 224. 109	13, 838. 729	$2p_{10}-4d_3$
2	7, 227. 34	13, 832. 55	
2	7, 234. 58	13, 818. 70	
1	7, 252. 70	13, 784. 18	
1	7, 259. 95	13, 770. 41	
80	7, 287. 262	13, 718. 801	$2p_{10}-2s_2$
5	7, 301. 25	13, 692. 52	
1	7, 316. 01	13, 664. 89	
1	7, 319. 69	13, 658. 02	
1	7, 322. 03	13, 653. 66	
5	7, 327. 00	13, 644. 40	
1	7, 333. 82	13, 631. 71	
4	7, 334. 33	13, 630. 76	
2	7, 341. 16	13, 618. 08	
1	7, 341. 66	13, 617. 15	

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
1	7, 344. 41	13, 612. 05	
1	7, 345. 34	13, 610. 33	
1	7, 348. 10	13, 605. 22	
4	7, 355. 48	13, 591. 57	
5	7, 359. 96	13, 583. 29	$2p_5-5d_5$
1	7, 360. 65	13, 582. 02	
4	7, 362. 83	13, 578. 00	
2*h*	7, 366. 80	13, 570. 68	
2*h*	7, 367. 02	13, 570. 28	
1	7, 370. 18	13, 564. 46	
1	7, 373. 86	13, 557. 69	
1	7, 392. 39	13, 523. 70	
1	7, 399. 82	13, 510. 12	
1*h*	7, 402. 70	13, 504. 87	
60	7, 425. 54	13, 463. 33	$2p_8-3s_4$
1*h*	7, 427. 61	13, 459. 58	
3*h*	7, 465. 01	13, 392. 14	
100	7, 486. 850	13, 353. 082	$\begin{cases}2p_{10}-2s_3\\2p_9-3s_5\end{cases}$
20	7, 493. 58	13, 341. 09	$2p_8-4d_2$
30	7, 494. 15	13, 340. 07	$2p_8-3s_5$
3	7, 543. 10	13, 253. 50	
3	7, 550. 63	13, 240. 29	
1, 000	7, 587. 4135	13, 176. 0999	$1s_4-2p_5$
2, 000	7, 601. 5465	13, 151. 6027	$1s_5-2p_6$
1	7, 615. 64	13, 127. 27	$2p_4-4s_1''$
1	7, 620. 63	13, 118. 67	
1	7, 628. 24	13, 105. 58	
1	7, 639. 55	13, 086. 18	
3*h*	7, 652. 16	13, 064. 61	
2	7, 663. 75	13, 044. 86	
400	7, 685. 2472	13, 008. 3682	$1s_2-2p_1$
500	7, 694. 5401	12, 992. 6577	$1s_5-2p_7$
2	7, 703. 35	12, 977. 79	
10	7, 741. 37	12, 914. 06	
50	7, 746. 831	12, 904. 958	$2p_{10}-4d_6$
1	7, 767. 29	12, 870. 97	
2	7, 768. 42	12, 869. 09	$2p_9-4d_1''$
2	7, 772. 42	12, 862. 47	
15	7, 776. 27	12, 856. 10	$2p_8-4d_1''$
1	7, 786. 65	12, 838. 96	$2p_8-3s_1'$
15	7, 806. 52	12, 806. 29	$2p_7-3s_4$
1	7, 830. 22	12, 767. 53	
3*h*	7, 840. 17	12, 751. 32	
200	7, 854. 823	12, 727. 535	$1s_3-2p_3$
3	7, 863. 91	12, 712. 82	$2p_9-4d_3$
1	7, 871. 92	12, 699. 89	$2p_8-4d_3$
5	7, 881. 77	12, 684. 02	$2p_7-4d_2$
2	7, 882. 36	12, 683. 07	$2p_7-3s_5$
4	7, 904. 63	12, 647. 34	$2p_6-3s_4$

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
50	7, 913. 443	12, 633. 254	$2p_{10}-4d_5$
6	7, 920. 46	12, 622. 06	$2p_9-4d_4$
40	7, 928. 602	12, 609. 100	$2p_8-4d_4$
1	7, 938. 69	12, 593. 07	$2p_9-2s_2$
3	7, 946. 98	12, 579. 94	$2p_8-2s_2$
1	7, 981. 26	12, 525. 91	$2p_6-4d_2$
10	7, 982. 37	12, 524. 17	$2p_6-3s_5$
1	7, 993. 17	12, 507. 25	$2p_4-4s_1'$
2	8, 026. 38	12, 455. 50	
100	8, 059. 5053	12, 404. 3030	$1s_3-2p_4$
30	8, 104. 02	12, 336. 17	$2p_9-4d_4'$
200	8, 104. 3660	12, 335. 6408	$1s_5-2p_8$
500	8, 112. 9023	12, 322, 6615	$1s_5-2p_9$
2	8, 132. 96	12, 292. 27	
1*h*	8, 144. 99	12, 274. 12	$2p_{10}-3s_1''$
1*h*	8, 175. 04	12, 229. 00	
300	8, 190. 0570	12, 206. 5759	$1s_4-2p_6$
2	8, 192. 31	12, 203. 22	$2p_3-4s_1''$
15	8, 195. 08	12, 199. 09	$2p_7-4d_1''$
1	8, 199. 39	12, 192. 68	
1	8, 205. 14	12, 184. 14	$2p_3-4s_1'$
2	8, 206. 59	12, 181. 98	$2p_7-3s_1'$
1	8, 209. 54	12, 177. 61	$2p_2-4s_1''$
2	8, 218. 39	12, 164. 49	
1	8, 222. 68	12, 158. 15	$2p_2-4s_1'$
1	8, 228. 83	12, 149. 06	
400	8, 263. 2412	12, 098. 4676	$1s_2-2p_2$
20	8, 272. 37	12, 085. 12	$2p_2-4s_1'''$
1	8, 277. 41	12, 077. 76	
200	8, 281. 06	12, 072. 43	$1s_2-2p_3$
1	8, 287. 56	12, 062. 96	
500	8, 298. 1091	12, 047. 6312	$1s_4-2p_7$
5	8, 301. 38	12, 042. 88	$2p_7-4d_3$
2	8, 303. 18	12, 040. 27	$2p_6-4d_1''$
1	8, 351. 42	11, 970. 73	
2	8, 384. 87	11, 922. 97	$2p_7-2s_2$
1	8, 386. 61	11, 920. 50	
10	8, 412. 45	11, 883. 88	$2p_6-4d_3$
2	8, 498. 18	11, 764. 00	$2p_6-2s_2$
200	8, 508. 8736	11, 749. 2128	$1s_2-2p_4$
3	8, 537. 92	11, 709. 24	$2p_4-4s_1''''$
3	8, 560. 88	11, 677. 84	$2p_5-3s_4$
2	8, 568. 94	11, 666. 86	
2	8, 605. 83	11, 616. 84	
1	8, 651. 29	11, 555. 80	$2p_5-4d_2$
1	8, 667. 94	11, 533. 60	
3	8, 697. 54	11, 494. 35	$2p_8-4d_5$
1	8, 755. 15	11, 418. 72	
8	8, 764. 11	11, 407. 04	$2p_9-4d_1'$
1	8, 773. 02	11, 395. 46	

TABLE 3.—*List of Kr I lines*—Continued

Intensity	Wave length	Wave number	Comb.
10	8, 774. 10	11, 394. 05	$2p_8-4d_1'$
300	8, 776. 7898	11, 390. 6150	$1s_4-2p_8$
2	8, 780. 33	11, 385. 97	$2p_3-4s_1''''$
200	8, 928. 6934	11, 196. 7764	$1s_5-2p_{10}$
1	8, 967. 52	11, 148. 30	$2p_9-3s_1''$
3	8, 977. 95	11, 135. 35	$2p_8-3s_1''$
2	8, 999. 11	11, 109. 16	$2p_7-4d_6$
1	9, 111. 66	10, 971. 94	$2p_9-3s_1'''$
1	9, 243. 62	10, 815. 31	
2	9, 352. 12	10, 689. 83	
2	9, 362. 10	10, 678. 44	$2p_6-4d_5$
5	9, 751. 71	10, 251. 84	$1s_4-2p_{10}$
1	9, 856. 19	10, 143. 13	$2p_6-3s_1'''$

The term sequences formerly designated by md_2 and ms are now interpreted as the extensions of the ms_4 and ms_5 series, respectively. The term 8,393.307 is now designated as $2s_3$ instead of $4d_6$. This choice makes the difference $2s_3-2s_2$ smaller than $1s_3-1s_2$ as it should be. The new term 8,841.431 at first thought to be $2s_3$ is interpreted as $4d_6$. This assignment makes the md_6 series run more smoothly.

The p terms are left unchanged except for the extensions to higher series members permitted by the measurement of newly observed lines in the ultra-violet region. The identification of $2p_1$ which was somewhat doubtful in the original investigation (RP89, p. 147) due to the fact that it was assigned from only one combination, $1s_2-2p_1$, 13,008.368 cm^{-1}, has now been confirmed by the observation of $1s_4-2p_1$, 17,938.27 cm^{-1}. The higher members of the series mp_8, and mp_9 are merged together. The peculiar analogy between the discontinuities in the mp_5 and mp_{10} sequences (RP89, fig. 5, p. 154) may be noted from the effective quantum numbers as far as both series can be traced. A new sequence of f terms with inner quantum number 2 have been found. The series has been designated by mZ.

The reality of all the d terms reported in the previous paper has now been confirmed, due to improved measurements and the observation of practically all expected combinations. The series have also been extended by the discovery of some 20 new terms. A new sequence with j equal to 1 has been found. This series is designated by md_2. It should not be confused with the old md_2 series now interpreted as ms_4. There is some uncertainty as to the higher members of the d_3 and d_4 series. The term 1,867.81 now assigned to $8d_3$ since it combines with $2p_7$ and $2p_{10}$ as well as with $2p_9$, $2p_8$, and $2p_6$ was formerly interpreted as $8d_4$. With the present assignment no completely satisfactory value for $8d_4$ can be found unless it is coincident with $8d_3$, a possibility favored by the intensities of the combination lines. It may be seen that the 8 series of d terms predicted by the Hund theory have all been observed.

The $3d_5$ term is found from far ultra-violet data. (RP89, p. 153.) The other $3d$ terms have not been found. Possibly some of the unclassified lines between 13,000 and 14,000 cm^{-1} are combinations of these terms with higher p terms.

Four sequences of non-Ritzian d terms are predicted by the Hund theory. Three of the lowest group with values close to 9,000 cm^{-1} have been found, and all four of the next group ranging around 3,000 cm^{-1}. These sequences are designated by ms_1', ms_1'', ms_1''', and ms_1''''. Altogether 48 new terms have been added to the original list.

A contribution worth special mention is found in the resolution of close pairs of lines which are not separated heretofore. Such lines occur at 3,431 A, 3,846 A, 3,991 A, 4,969 A, 5,504 A, 6,555 A, 6,904 A, and 8,104 A. In our first analysis of the Kr I spectrum (RP89) it was assumed that 8,113 was a double line so as to obtain a starting point for the $2p_9-4d'_4$ series. The duplicity is now definitely assigned to 8,104 A and the line at 8,104.02 A is to be considered as the first member of the subordinate series mentioned.

The data presented in Table 3 of the present paper being so much superior to those given in our preliminary description, should be regarded as entirely superseding Table 12 of the earlier paper.

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